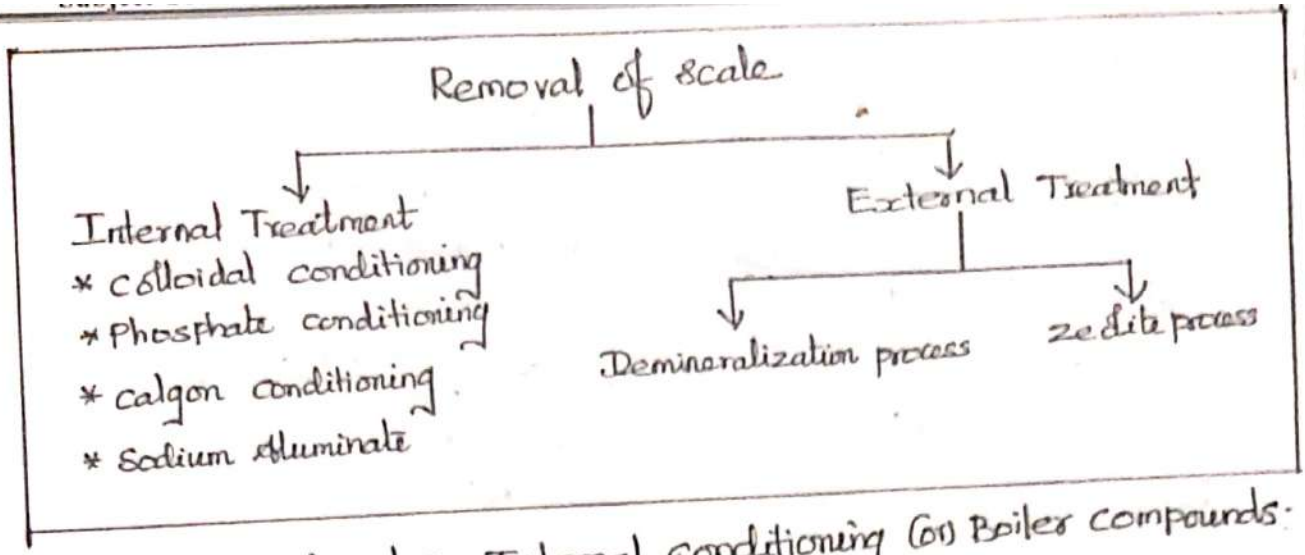

Internal Treatment (or) Internal conditioning (or) Boiler compounds:

An internal treatment is accomplished by adding a proper chemical to the boiler water.

The scale forming substance were not completely removed by external treatment. So the chemicals are added directely into the boiler to remove scale forming substance. The chemicals are also called as boiler compounds.

Important internal treatment methods:

(a) colloidal conditioning
(b) phosphate conditioning
(c) calgon conditioning
(d) Sodium Aluminate conditioning.

(a) colloidal conditioning:

Scale forming substance [adherent nature] $\xrightarrow{\text{Agar-Agar/ kerosene/Gelatin}}$ Scale forming substance [Non-adherent/soft precipitate]

In low pressure boilers, scale formation can be avoided by adding organic substance like kerosene tannin, agar-agar etc.... These substance get coated over the scale forming precipitates and change and change them into non-sticky and loose deposits.

These loose precipitate can be removed by blow down operation

(b) Phosphate conditioning:

In high pressure boilers, scale formation can be avoided by adding Sodium phosphate

The phosphate reacts with calcium and magnesium salts to give soft sludges of calcium and magnesium phosphates.

$$3CaCl_2 + 2Na_3PO_4 \longrightarrow Ca_3(PO_4)_2 + 3Na_2SO_4$$

[Hard scale] [Soft sludge] Loose ppt.

Phosphate	Nature	Usage
Na_3PO_4	Alkaline	Alkalinity of boiler water is low
Na_2HPO_4	Weakly alkaline	Alkalinity of boiler water is adequate
NaH_2PO_4	Acidic	Alkalinity of boiler water is too high.

(c) Calgon conditioning:

Calgon is Sodium hexa meta phosphate $Na_2[Na_4(PO_3)_6]$. This Substance interacts with calcium ions forming a highly soluble complex and the prevents the precipitation of scale forming salt.

$$2CaSO_4 + Na_2[Na_4(PO_3)_6] \longrightarrow Na_2[Ca_2(PO_3)_6] + 2Na_2SO_4$$

[Soluble complex]

* The complex $Na_2[Ca_2(PO_3)_6]$ is soluble in water and there is no problem of sludge disposal.

*So calgon conditioning is better than phosphate conditioning.

(d) Carbonate conditioning:

i) Carbonate conditioning is used for low pressure boilers.

ii) Here the salts like $CaSO_4$ are converted to easlity removable $CaCO_3$.

iii) But in high pressure boilers, the excess Na_2CO_3 undergoes hydrolysis and is converted to NaOH.

iv) It leads to caustic embrittlement and boiler corrosion. So it is less preferred.

$$CaSO_4 + Na_2CO_3 \longrightarrow CaCO_3 + Na_2SO_4$$